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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/068,494	02/04/2002	Edward L. Martin	042390.P13718	7274

7590 12/18/2003

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EXAMINER

ERDEM, FAZLI

ART UNIT	PAPER NUMBER
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2826

DATE MAILED: 12/18/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/068,494

Applicant(s)

MARTIN ET AL.

Examiner

Fazli Erdem

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 11 August 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1 and 3-22 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,3,4,7-12 and 15-22 is/are rejected.
- 7) ☒ Claim(s) 5,6,13 and 14 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 13) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.
- a) ☐ The translation of the foreign language provisional application has been received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) ✓
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 9.

- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Allowable Subject Matter

1. Claim 5, 6, 13 and 14 objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1, 3-4, 7-12 and 15-21 rejected under 35 U.S.C. 103(a) as being unpatentable over Jiang et al. (US 2002/0047216) in view of Chia et al. (5,841,198) further in view of DiStefano et al. (5,801,446) further in view of Kitajima (et al. (6,495,441).

Regarding Claims 1, 3-4, 7-12 and 15-21, Jiang et al. disclose a ball grid array for a flip chip assembly where the ball grid array includes a plurality of bumps bonded between and active surface of a semiconductor die and a top surface of a printed circuit board or any type of substrate carrier. The plurality of balls includes at least one bump having a core material and an outer layer. The rigidity of the core material is greater than that of the material for the outer layer. The melting temperature of the core material is higher than the material of the outer layer. Jiang et al. fail to disclose the required board, pad and board/pad/core configuration. However, Chia et al. disclose a ball grid array package employing solid core solder balls where the required

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board structure is disclosed. Furthermore, DiStefano et al. disclose microelectronic connections with solid core joining units where the required pad structure is disclosed. Finally, Kitajima et al. disclose a semiconductor device with gold bumps and method and apparatus of producing the same where the required board/pad/core configuration is disclosed.

It would have been obvious to one of having ordinary skill in the art at the time the invention was made to include the required board, pad, board/pad/core structures in Jiang et al. as taught by Chia et al., DiStefano et al., and Kitajima et al. respectively in order to have a semiconductor packaging structure with higher reliability.

3. Claim 22 rejected under 35 U.S.C. 103(a) as being unpatentable over Jiang et al. (6,610,591) in view of Smith (6,303,408) further in view of Shimada et al. (6,087,597) further in view of Kitajima et al. (6,495,41).

Regarding Claim 22, Jiang et al. disclose methods of ball grid array for a flip chip assembly where the ball grid array includes a plurality of bumps bonded between and active surface of a semiconductor die and a top surface of a printed circuit board or any type of substrate carrier. The plurality of balls includes at least one bump having a core material and an outer layer. The rigidity of the core material is greater than that of the material for the outer layer. The melting temperature of the core material is higher than the material of the outer layer. Jiang et al. fail to disclose the required method for board, pad and board/pad/core configuration. However, Smith discloses microelectronic assemblies with composite conductive elements where the required method for the board is disclosed. Furthermoer, Shimada et al. disclose connecting member and connecting method with ball and tapered via where the required method

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for the pad is disclosed. Finally, Kitajima et al. disclose a semiconductor device with gold bumps and method and apparatus of producing the same where the required method for board/pad/core configuration is disclosed.

It would have been obvious to one of having ordinary skill in the art at the time the invention was made to include the required method for the board, pad, board/pad/core structures in Jiang et al. as taught by Smith, Shimada et al., and Kitajima et al. respectively in order to manufacture a semiconductor packaging structure with higher reliability.

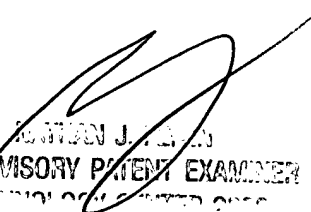
Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Fazli Erdem whose telephone number is (703) 305-3868. The examiner can normally be reached on M - F 8:00 - 5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nathan Flynn can be reached on (703) 308-6601. The fax phone number for the organization where this application or proceeding is assigned is (703) 308-7722.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

FE
December 1, 2003


NATHAN J. FLYNN
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER